P60/K300 MONITORING SYSTEM

INSTALLATION MANUAL

KEF ELECTRONICS LIMITED,TOVIL,MAIDSTONE,KENT,ENGLAND

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1.0 GENERAL DESCRIPTION

The P60 monitoring system consists of two P60 loudspeakers and one K300 equaliser/amplifier. It can be used for any audio monitoring situation where modest size, high quality and high output are required. This includes radio and television control room monitoring, outside broadcasting, editing suites, nearfield pop monitoring, programme quality control, cutting rooms, and classical music monitoring.

The P60 system takes full advantage of the hybrid crossover, a newly developed technique combining the best attributes of active and passive crossovers. A high level passive crossover combines the drive units with best possible phase overlay. It also prevents out of band energy due to amplifier overload from reaching the drive units. Low level active filtering equalises the system flat without wasting drive unit sensitivity and amplifier power in the passive network. Active bass extension prevents further reductions in system sensitivity by allowing the designer freedom to choose any low frequency extension and shape.

By designing the loudspeaker and amplifier as an integrated system, major engineering compromises are sidestepped. Traditional trade offs between mid band sensitivity and output, low frequency extension, and low frequency cut off shape no longer apply. Hybrid crossover results in a system with smoother, more balanced performance and greater dynamic range.

These performance parameters combine for a closer approach to the classic monitor requirement: a faithful replica of the input signal independent of music type and level, and consistent from system to system.

Note: the response shape of the P60 is mirror imaged by the equaliser shape within the K300. For this reason the P60 must not be used with other amplifiers or the K300 with other loudspeakers.

2.0 FEATURES P60 LOUDSPEAKER

2.1 P60 LOUDSPEAKER

Passive Butterworth Squared Crossover Network

In the P60 the job of the crossover is limited to the smooth blending of the drive units, no response shaping is done passively, preventing the typical power wastage of conventional crossovers and preserving the maximum system dynamic range.

The P60's passive crossover when combined with the drive unit response yields an acoustic Butterworth squared shape of the Linkwitz-Riley family. This gives an exact phase overlay between the two drive units throughout the crossover region. This exact phase overlay ensures optimum driver blend with no peaks in the off axis response or the power response.

Low Colouration Box Construction

High density particle board and MDF, of generous thickness make up an enclosure of extremely stiff characteristics. Panel resonances that remain are damped by an application of damping pads and special adhesive. These steps ensure that cabinet resonances do not colour the sound.

Low Diffraction Grille

A new grille of novel design continues the flare of the HF unit mounting plate and thereby reduces diffraction and reflection effects across the front of the baffle. This greatly reduces the response differences between the grille off and grille on condition and also contributes to response smoothness, reducing colourations in the HF unit's range.

KEF Mounts

'KEF Mounts', a proprietary rubber suspension between the low frequency drive unit and the cabinet, further reduce vibration transmitted to the cabinet. The voice coil reaction forces work against the mass of the motor and chassis, rather than the complex impedance of the box.

Ferrofluid Protected HF Unit

The HF unit (tweeter) has its thermal capacity increased by a magnetic fluid surrounding the voice coil. This carries away power dissipated in the coil and thereby improves its power handling. As the general operating temperature is reduced, the compression due to thermal effects reduce and response becomes less a function of input level.

2.2 K300 AMPLIFIER

2 x 150 Watt Amplifier

The externally rack-mounted 2U high amplifier is capable of 150 watts per channel into a 4 ohm load, 24.5V rms into a P60 loudspeaker.

Active Equalisation

Shaping of the loudspeaker's response is done by active equalisation within the amplifier, rather than through power wastage within the loudspeaker. Equalisation is first optimised by computer and then further refined after exhaustive listening tests. The P60 system sets new standards for response smoothness and balance.

Active Bass Extension

Active bass extension allows the P60's LF response to be equalised with a complementary response which precisely extends and reshapes it to a new lower limit. This frees the designer of the LF drive unit from the normal tradeoffs of MF sensitivity versus LF extension.

Low Frequency Shelving

A 2dB per step, five position bass shelf is provided for the minor equalisation required by room effects and placement effects. The two channels may be independently set but cannot be set without internal access to the amplifier, thereby preventing indiscriminate changes by unauthorised personnel.

Calibrated Input Sensitivity Control

A continuously variable active input sensitivity control, calibrated over the useful range of -6 to +14dBm, allows the input sensitivity to be preset to the nominal mixing console output level, ensuring proper signal levels and optimum signal to noise.

Active Balanced Input

Active balanced input circuitry features high common mode noise rejection. An optional input transformer converts the input to fully floating, allowing up to 100V DC offset above ground. The novel virtual earth transformer termination greatly reduces typical transformer distortion. All connections are through XLR connectors to IEC specification.

3.0 UNPACKING

The P60 and K300 are shipped in sturdy cardboard cartons with moulded polystyrene inner packing to ensure against shipping damage. To unpack carefully slit the upper carton tape and remove the upper polystyrene tray. The P60 system can then be drawn out by its polythene bag. Alternatively, slit the carton tape and fold the four top flaps back. Roll the system slowly over until fully inverted. The carton may then be removed along with the polystyrene inner packing. Save all packing for future shipment or storage. Systems returned for service must be properly packed in their original cartons to ensure arrival without damage.

4.0 MOUNTING

4.1 ROOM PLACEMENT

Much of the final performance of the P60 monitoring system will be determined by the acoustics of the listening room and the positioning of the system and the listener within this room. The dimensions of the room, the construction of the walls, damping materials on the walls and furniture within the room determine the standing waves and resonances that have a major effect on the lowest octaves of sound. Large reflecting surfaces have the effect of simulating extra sound sources that promote colourations and degrade stereo imaging.

For best performance site both the loudspeakers and listener away from walls and major reflecting surfaces. Experiment with placement within the room. Peaks and dips in the low frequency response can be reduced with movement toward the nodes or antinodes of offending standing waves.

The directional characteristics of the P60 are quite smooth. If there is to be a single listener or an optimum listening position then the system's tweeter axis should be aimed at that position. If a range of positions must be provided for, then aim the system towards the listening area remembering that it is better that the system axis cross in front of the listener than behind.

4.2 MOUNTING

Within the framework of the above siting recommendations, many means of mounting are possible; wall shelving, custom stands or hanging brackets. Tee nuts are inset into the back panel of the P60 to accept M6 bolts. The bolt pattern is intended for the Omnimount 100 series of loudspeaker brackets or can be used for custom bracketry. A sturdy mounting with provision for aiming will give best results.

5.0 CONNECTIONS

5.1 INPUT LEADS

The actively balanced input of the K300 has high rejection to external noise and hum when properly driven. Both balanced and unbalanced sources may be used for hum free connections. The K300 has its case mains earthed. In general, if the source is also mains earthed, the cable shield should be connected at the source only. If the shield must be connected at both ends it should be through pin 1 of the input XLR rather than the connector body. An earthing resistor between pin 1 and case serves to reduce circulating currents.

a) Balanced source
Use twin screened cable as shown in Figure 1A. Signal and return connections are made to pins 2 and 3 respectively at both the source and the K300. The cable screen should be connected to case at the source end. For unearthed sources also connect cable screen to K300 at pin 1. This presents a 20K ohm input impedance to the source.

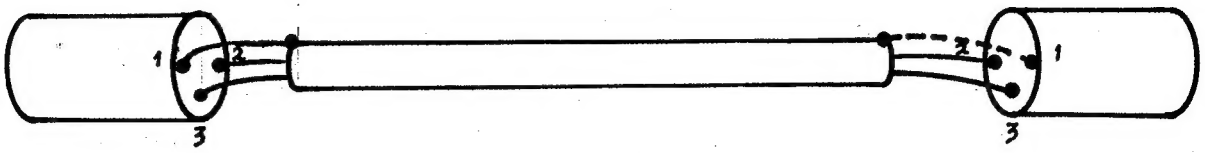
b) Unbalanced source, screened twin cable
When using screened twin cable with an unbalanced source, connect as shown in Figure 1B. At the K300 connect signal and return to pins 2 and 3 respectively. For unearthed sources also connect cable screen to pin 1. At the source link both return and screen to case. This presents a 10K ohm input impedance to the source.

c) Unbalanced source, single core or "co-axial" cable
as would typically be used for connecting a K300 to domestic equipment. Input signal is connected through the centre conductor to pin 2 of the K300 with screen to pin 3 for earthed source and to pin 1 and 3 for unearthed sources, as shown in Figure 1C. This presents a 10K ohm input impedance to the source.

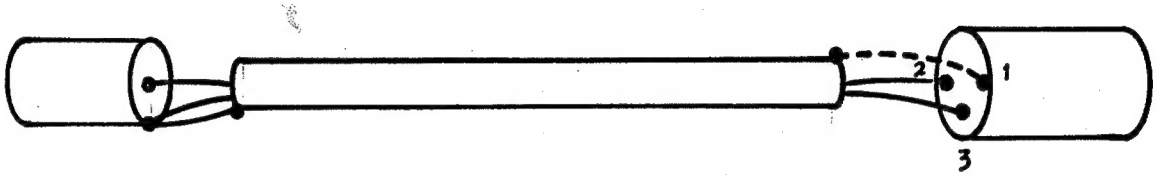
5.2 OUTPUT LEADS

The output of the K300 amplifier feeds to the P60 loudspeaker using the supplied XLR connectors and a cable of length as required for the installation. Wire gauge should be appropriate for the length of run, its total resistance being the dominant factor. As a 4 ohm nominal system cable resistance of up to 0.5 ohms will keep power loss and response ripple to 1dB or less. Double insulated mains cable with a round PVC outer sheath is durable, flexible, and easily available in a variety of conductor areas. Table 1 shows the maximum length for 0.5 ohms resistance with a variety of conductor sizes.

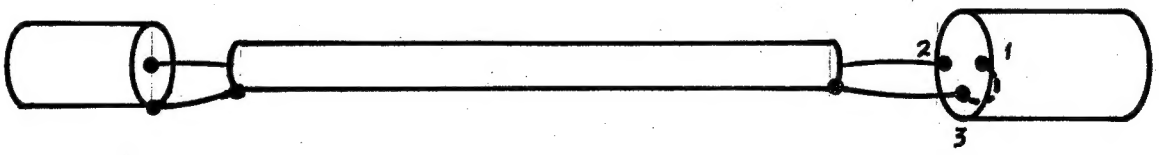
Heavier gauge wire or shorter runs than maximum will reduce the total resistance and hence reduce power loss and response variation. Note that the maximum run assumes two lengths of conductor.



1(a) Balanced Source



1(b) Unbalanced Source, Screened Twin Cable



1(c) Unbalanced Source, Single Core Cable

FIGURE 1: INPUT LEADS

Current Rating	Conductor Area mm^2	Ohms/ metre	Maximum Run metres
3A	0.5	0.034	7.5
6A	0.75	0.023	11.0
10A	1.0	0.017	15.0
15A	1.5	0.011	22.0
USA AWG			
18	0.82	0.021	12.0
16	1.31	0.013	19.0
14	2.08	0.0083	30.0
12	3.31	0.0052	48.0
10	5.26	0.0033	76.0

TABLE 1

6.0 OPERATION

6.1 SETTING INPUT SENSITIVITY

The input sensitivity control is continuously variable over a wide range with calibration marks over the +14 to -6dBm range. By using this calibrated control the K300 amplifier sensitivity can be set optimally between the noise floor and clipping level of the control desk. The calibration markings correspond to an input required to give a nominal loud level (105dB at 1m) but not the maximum level the system is capable. (This will be 6 to 10dB more depending on frequency). This sensitivity control will be set to the nominal control desk output (+4dBm for 0Vu as an example) with the understanding that peaks above the nominal desk output will routinely occur, driving the system towards full output.

In this manner peak levels (above nominal) of the control desk and monitoring system will be well matched and system noise will be minimised. If more "gain in hand" is required the amplifier sensitivity can be increased with clockwise rotation of the control. If the "gain in hand" is too great and the desk monitor output is found to be set too low then the system sensitivity can be decreased by counter clockwise rotation of the control. It is worth noting that channel balance has been optimised for settings near +4dBm. Once set the sensitivity control need not be touched again.

6.2 BASS SHELVING

A five position, 2dB per position, jumpered control can be found within the amplifier. This can be adjusted to aid in optimising the performance within the listening room. As the controls effect is broad but subtle it cannot cope with specific room faults that would require acoustic treatment. However, if after room treatment and optimal speaker siting (as covered in the section on room placement) the system is determined to be generally bass thin or bass dominant, then the control can be adjusted to improve the overall balance.

To Adjust the Control Remove The Mains Input Lead To The K300 Amplifier

With mains removed from the K300 the top and bottom cover may be removed for access to the bass shelving controls: the five position jumper found on each of the auxiliary boards mounted on each amplifier board. These jumpers may be re-positioned in 2dB steps in directions indicated for an increase or decrease of level below 200Hz. The amplifier cannot be operated without the jumpers in place. Replace top and bottom covers before re-applying mains.

7.0 TECHNICAL DATA

7.1 LOUDSPEAKER TYPE P60 SP3071

Dimensions	470(h) x 250(w) x 312(d) mm
Internal Volume	24 litres
LF Driver	B200 SP1216 200mm dia. diecast chassis, polypropylene diaphragm
HF Driver	T33 SP1210 25mm dia. soft dome Ferrofluid cooled
Dividing Frequency	3kHz
Nominal Impedance	4 ohms
Net Weight	15 kg

7.2 AMPLIFIER TYPE K300 SP2072

Dimensions:	19inch rack mounting x 2U high
Max. Power Output:	150 watts per channel into 4 ohms
Max. Voltage Output	24.5 volts rms
Signal to noise Ratio:	100dB A weighted (rel. to 24.5 rms) output
Input Impedance:*	22 kilohms active balanced input 11 kilohms unbalanced
Input Sensitivity:	0dBM= 0.775 volt for full output Sensitivity is adjustable by a front panel control - continuously variable and calibrated over the range +14 to -6dBM
Mains Voltage:	110-120V or 220-240V 50-60Hz
Weight:	15kg

* an optional transformer is available to provide a fully floating input and high DC offset tolerance.

7.3 PERFORMANCE

Frequency Range:	60 to 22,000Hz +/-2dB
Low Frequency Extension:	-3dB at 60Hz -6dB at 40Hz
Directional Characteristics:	Horizontally within 3dB of reference axis, response up to +/-25 degrees at 10kHz
	Vertically within 3dB of reference axis, response up to +/-5 degrees at 10kHz
Maximum Acoustic Output:	113dB spl each system at 1m

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